Date Mailed
October 30, 2001

BEFORE THE

PUBLIC SERVICE COMMISSION OF WISCONSIN

Joint Application of Minnesota Power Company and
Wisconsin Public Service Corporation for Authority to
Construct and Place in Service Electric Transmission Lines
and Other Electric Facilities for the Arrowhead-Weston Project,
Located in St. Louis County in Minnesota, and Chippewa, Clark,
Douglas, Lincoln, Marathon, Oneida, Price, Rusk, Sawyer, Taylor,
and Washburn Counties in Wisconsin

05-CE-113

FINAL DECISION

Introduction

Background

From the origin of the electric utility industry more than a century ago, the growth in electricity demand and the resulting increase in generation has been matched by ever-increasing need for interconnection of electric power systems. The first power plants served only a few city blocks. The development of electric transmission systems, however, allowed power plants to be linked to serve entire cities, states, and ultimately, large multistate regions. Between 1950 and 1970 many miles of high-voltage transmission lines were constructed within and between regions, ultimately encompassing virtually all electrical loads in the contiguous United States and Canada within four interconnected systems. Wisconsin is within the Eastern Interconnection, extending from Saskatchewan to Florida and New Mexico to Nova Scotia.

The growth of interconnections within the power system allows ever-larger transfers of power between areas and enables utilities to take advantage of distant lower-cost generation. More importantly, it also permits utilities to take advantage of the diversity of electricity demand

and generation between different parts of the power system, thereby enhancing the reliability of all of the interconnected regions. To ensure reliability of service, operators must maintain the system with some generation capacity in excess of peak customer demand. This surplus is commonly referred to as reserve margin. By sharing their generation resources via an interconnected system with neighboring utilities experiencing particularly high demand or an unanticipated generation outage, utilities can reduce the required reserve margin throughout the system. Increased interconnections have contributed to increased reliability and decreased prices.

With increasing interconnection of the nation's electric system comes increasing risk that a systematic failure in one part of the country would cause a catastrophic failure across large regions of the country. This risk became evident in November 1965 when a large-scale blackout occurred in the Northeast, which affected millions of customers and a large region of the country. This blackout demonstrated that close coordination of the interconnected electric network was necessary in order to reduce the risk of large-scale disturbances. In response, the North American Electric Reliability Council (NERC) was formed. The NERC is a system of ten reliability councils, which encompass all North American power systems. The reliability councils, in turn, are composed of the electric utilities within each region and undertake coordinated planning and operation to reduce the risk of widespread outages.

Until recently, utilities used the transmission network primarily in a cooperative manner with the goal of promoting the reliability of the interconnected systems. In 1996, the Federal Energy Regulatory Commission (FERC) issued Order 888, which required most transmission owning utilities to permit open access to their transmission system by other parties. This has

permitted generators and electric power users separated by great distances to engage in bulk power transactions. This, in turn, has increased the number of transactions and the amount of electric power moving across the transmission network between various regions of the country.

The increase in use of the existing transmission network for bulk power transactions has affected the reliability of the electric transmission system in Wisconsin.

Wisconsin is divided electrically between eastern and western areas. Utilities in western Wisconsin (generally west and north of the Wisconsin River Valley) belong to the Mid-Continent Area Power Pool (MAPP) and generally have sufficiently strong connections with Minnesota to meet their power needs. Utilities in eastern Wisconsin belong to the Mid-America Interconnected Network (MAIN) and serve the bulk of the electrical demand in the state.

Eastern Wisconsin and that portion of Upper Michigan, which is part of MAIN, comprise a geographical subset of MAIN called Wisconsin-Upper Michigan System (WUMS). Electrically, WUMS is closely integrated into MAIN. Because WUMS is bordered on the east by Lake Michigan and on the north by Lake Superior, significant power imports can be achieved only from the west and south. The WUMS Western Interface (across western Wisconsin to Minnesota and Iowa) is crossed by only one major transmission line – the 345,000 volt (345 kV) Eau Claire-Arpin line – and a number of lower voltage lines. The Southern Interface (the Wisconsin–Illinois Border) is crossed by three 345 kV lines. Beyond the Western Interface, an extensive transmission system exists, extending from Duluth to Iowa. By improving this connection, the transfer of power into WUMS would be greatly improved. Likewise,

reinforcement of the Southern Interface would permit increased power flows into WUMS from the extensive transmission system existing in northern Illinois.

Combined with the large electrical demand in eastern Wisconsin and the geographic isolation of WUMS, the weakness of the MAPP-MAIN interconnection across the Western Interface poses a reliability risk in Wisconsin. In essence, the most significant reliability-threatening transmission constraints experienced in Wisconsin are those associated with moving power into eastern Wisconsin.

Reliability Incidents In Wisconsin

In recent years, two episodes occurred which highlighted the limitations of the Western Interface into WUMS. The first occurred in 1997 during a period of heightened Nuclear Regulatory Commission (NRC) oversight of the operation of nuclear power plants. As a consequence of this heightened oversight and associated unanticipated outages, all three nuclear units located in Wisconsin, plus three located in Illinois and one located in Minnesota were off-line at the same time. Due to the unavailability of nuclear generation in the region during summer of 1997, Wisconsin utilities sought to purchase replacement power from out-of-state generators. As a consequence of this, the Eau Claire-Arpin 345 kV line became heavily loaded and reached its maximum capacity on several occasions. Transmission line loading relief procedures were initiated several times and on June 11, 1997, the Eau Claire-Arpin line tripped and created a disturbance on the system. The first effect was to cause an excessive phase angle difference at Arpin thereby preventing reclosure of the tripped line for fear of damaging the Weston power plant. It also precipitated a dangerous reduction in voltages in eastern Iowa and northwestern Illinois and depleted all of the reactive power reserves at generating plants in the

Quad Cities area. Depressed voltage with no reactive power reserves to restore voltage signals a significant vulnerability of the system to voltage collapse.

The second incident occurred on June 25, 1998. Lightning caused a 345 kV line connecting Minnesota to Iowa and Missouri to trip out of service and, while service was being restored on that line, the same storm caused the King-Eau Claire line to trip out of service. The loss of two major lines caused a number of additional lines to trip, which ultimately led to the creation of an electrical island in MAPP immediately adjacent to Wisconsin and caused the MAPP transmission system to separate into parts. After this separation, the level of northern MAPP generation was in excess of what could be delivered to load. The result of this was instability and a blackout in the western part of Ontario.

WRAO Study and Recommendations

In response to the reliability issues and the potential for capacity shortages, former Governor Thompson requested that the state's electric utilities convene a task force to make recommendations on new generation and transmission measures necessary to avoid reliability issues in the future. In September 1997 the ad hoc utility group recommended additional generation in eastern Wisconsin and additional transmission capacity between eastern Wisconsin and other regions.

In 1998, the Wisconsin Reliability Assessment Organization (WRAO) was formed by several Wisconsin electric utilities. The WRAO formed a transmission analysis task force to study regional constraints affecting Wisconsin's ability to import electricity and to investigate system reinforcement alternatives to alleviate those constraints. The task force included participation from electric utilities in Illinois, Iowa, Minnesota, Wisconsin, Michigan, and Manitoba. MAPP and MAIN both endorsed the study group as a regionally recognized study

effort. The study group released an initial report in August of 1998 (*Wisconsin Interface Reliability Enhancement Study Phase I Report*)[1] and a second report in June 1999 (*Wisconsin Interface Reliability Enhancement Study Phase II Report*).[2] Following completion of the Phase II Report, the WRAO filed with the Commission on June 14, 1999, the *Report of the Wisconsin Reliability Assessment Organization on Transmission System Reinforcement in Wisconsin* (WRAO Report).[3] As a possible solution for alleviating the constraints identified in the study, the WRAO report recommended construction of a 345 kV line from the Arrowhead Substation near Duluth, Minnesota to the Weston Substation near Wausau, Wisconsin as outlined in Plan 3j of the report.

Procedural History

On November 10, 1999, Wisconsin Public Service Corporation (WPSC) and Minnesota Power Company (MP) jointly filed an application for the issuance of a certificate of public convenience and necessity (CPCN) for authority to construct the Arrowhead-Weston project as recommended in the WRAO Report. In addition, WPSC proposed to construct a 345/115 kV substation near Tripoli, Wisconsin and a 115 kV transmission line from the proposed Tripoli Substation to the Highway 8 Substation in Rhinelander, Wisconsin. The applicants' proposed routes for the new 345 kV line were approximately 210 miles in length, and the routes for the new 115 kV line were approximately 42 miles long.

[1] Introduced into the record as Exh. 173.

[2] Introduced into the record as Exh. 174.

[3] Introduced into the record as Exh. 175.

Wis. Stat. § 196.491(3)(a)1. prohibits any person from constructing a high-voltage transmission line without a CPCN from the Commission. Upon receiving a CPCN application, the Commission has 30 days to determine whether it is complete. Wis. Stat. § 196.491(3)(a)2. The Commission issued its declaration of completeness 30 days after the filing, on December 9, 1999. At least 60 days before filing a CPCN application with the Commission, the sponsor of a project must also submit an engineering plan to the Wisconsin Department of Natural Resources (DNR) that describes the project and its anticipated impact on air and water quality. Wis. Stat. § 196.491(3)(a)3.a. On June 2, 2000, the DNR verified to the Commission that WPSC and MP had provided sufficient information during the summer of 1999 to fulfill their statutory requirement to file an engineering plan.

Later in the course of this proceeding, a third party requested permission to become an applicant and co-sponsor the transmission project. The American Transmission Company LLC and ATC Management Inc. (collectively, "ATC") had been a party of record in the case but, on April 13, 2001, filed a motion for a change in status. After considering this request in open meeting, the Commission issued an order on June 29, 2001, approving ATC's application to become an applicant.[4] As part of this approval, the Commission declared that ATC was bound by all conditions, commitments, and agreements made by WPSC or MP in the course of the Commission proceedings.

Under Wis. Stat. § 196.31, the Commission has authority to provide funding to participants in its proceedings (other than public utilities) to compensate for some or all of the

[4] The Commission's open meeting was held on June 19, 2001. The Commission's order is dated June 29, 2001.

reasonable costs, necessary to create a record that adequately addresses significant issues in a Commission docket. In this case, the Commission ultimately authorized a total of $379,066 for intervenor compensation. It provided $209,306 to the organization Save Our Unique Lands (SOUL), $100,000 to the Citizens' Utility Board (CUB), $54,760 to Wisconsin's Environmental Decade (WED), and $15,000 to the World Organization of Landowner Freedom (WOLF).

The Commission issued a Notice of Proceeding, Assessment of Costs and Prehearing Conference on April 14, 2000. In that notice, the Commission ordered that parties could commence discovery as of the date of the notice. The notice also informed interested persons that they did not have to be a full party to participate in the case but could exercise virtually all of the rights of a party while participating as a "limited intervenor." *See,* Wis. Admin. Code § PSC 2.32 (2) (1997). In the notice dated April 14, 2000, persons were given until May 30, 2000, to file a request for intervention pursuant to Wis. Admin. Code § PSC 2.32 (3) (1997) and Wis. Stat. § 227.44 (2m) to become full parties to this proceeding.

A prehearing conference was held on May 15, 2000, at which time a list of proposed issues was developed to guide the hearing and procedures were established for the conduct of the hearing. On July 5, 2000, a Party and Status Order was issued in this proceeding. This order determined that 36 persons or organizations were entitled to participate as full parties pursuant to Wis. Admin. Code § PSC 2.32 (3) (1997). A second prehearing conference was held on September 22, 2000, for the purpose of finalizing the issues list and the procedures to be followed at the hearing.

The Commission held lengthy public hearings on this matter, both in northern Wisconsin and in Madison. It scheduled daytime and evening hearings to receive oral testimony from

interested members of the public in Rhinelander on November 28, 2000, in Tomahawk on November 29, 2000, in Abbotsford on November 30, 2000, in Wausau on December 1, 2000, in Superior on December 4 and 5, 2000, in Hayward on December 6, 2000, and in Ladysmith on December 7 and 8, 2000. During these hearings the Commission also accepted testimony in writing from members of the public who needed to leave early, or who preferred not to provide oral statements. From January 3, 2001 to February 23, 2001, the Commission held further hearings in Madison to receive testimony from technical witnesses of the parties and from Commission staff. The parties for purposes of review under Wis. Stat. § 227.47 are listed in Appendix A to this order. During this period, the Commission also provided an opportunity for people who own property in the project area but reside out of state, and those unable to attend the public hearings because of physical disabilities, to testify by telephone. In all, the Commission held nine days of hearings at which members of the public could testify and 22 days of hearings at which technical witnesses testified.

To preside at its hearings, the Commission appointed former Wisconsin Supreme Court Justice Janine Geske, a distinguished professor of law at Marquette University Law School and a reserve judge. The record developed at the hearings consists of 9,680 pages of transcript and 383 exhibits. Following the Commission hearings, parties submitted briefs and reply briefs. At its open meeting on August 17, 2001, the Commission approved the issuance of a CPCN to the applicants for the construction of the Arrowhead-Weston project via Owen and declined to issue a CPCN for the Tripoli Substation and the 115 kV line from Tripoli to Rhinelander.

Findings of Fact

1. WPSC is a public utility, as defined in Wis. Stat. § 196.01(5). MP is a Minnesota corporation that provides public utility services in Minnesota and Wisconsin through its utility affiliates. ATC is a transmission company, as defined in Wis. Stat. § 196.485(1)(ge), and a public utility, as defined in Wis. Stat. § 196.01(5).

2. The facilities approved in this order for the Arrowhead-Weston project[5] are necessary to satisfy the reasonable needs of the public for an adequate supply of energy.

3. The facilities approved in this order for the Arrowhead-Weston project are in the public interest considering alternative sources of supply and routes, individual hardships, engineering, economic, safety, reliability, and environmental factors.

4. The Oliver 1 Modified (Oliver to Exeland) and Owen 4 (Exeland to Weston via Owen) routes for the Arrowhead-Weston project use existing rights-of-way (ROW) to the extent practicable and minimize environmental impacts in a manner that is consistent with achieving reasonable electric rates.

5. The facilities approved in this order for the Arrowhead-Weston project will provide usage, service, or increased regional reliability benefits to wholesale and retail customers or members in this state, and the costs are reasonable in relation to the benefits of the project.

6. The facilities approved in this order for the Arrowhead-Weston project will not have undue adverse impact on other environmental values.

7. The facilities approved in this order for the Arrowhead-Weston project will not substantially impair the efficiency of an applicant's service or provide facilities unreasonably in

[5] In this order, "Arrowhead-Weston project" refers to the 345 kV transmission line and its associated facilities. It does not include the 115 kV transmission line and facilities proposed to serve WPSC's Upper West area.

excess of the probable future requirements. When placed in operation, the facilities will increase the value or available quantity of service in proportion to the amount they increase the cost of service.

8. The facilities approved in this order for the Arrowhead-Weston project will not unreasonably interfere with orderly land use and development plans for the area involved.

9. The facilities approved in this order for the Arrowhead-Weston project will not have a material adverse impact on competition in the relevant wholesale electric service market.

10. Alternatives that consist of energy conservation, the use of renewable resources, and the use of other energy priorities listed in Wis. Stat. §§ 1.12 and 196.025 are not cost-effective or technically feasible.

11. The scientific evidence in the record does not support a conclusion that electromagnetic fields (EMF) from transmission lines adversely affect human health or the health of farm animals. The record contains no credible evidence to support the theory that ground currents can adversely affect human health or the health of farm animals.

12. The conditions specified in this order are in the public interest considering individual hardships, engineering, economic, safety, reliability, and environmental factors and will not have undue adverse impact on environmental values. Specifically, it is in the public interest to require that WPSC, MP, and ATC:

a. Work with Commission staff, and with other appropriate federal and state agencies, to develop and implement a Construction and Mitigation Plan for the proposed Arrowhead-Weston project that provides specific information about environmentally sensitive

resources on the route and mitigation measures to avoid or minimize adverse impacts on those resources.

b. Refrain from commencing construction of any specific unit of the Arrowhead-Weston project until the Commission has approved both Part A of the Construction and Mitigation Plan and, for that specific unit, Part B of the plan.

c. Hire one or more environmental inspectors per construction spread and an environmental manager. It is reasonable to require that these environmental inspectors be funded by WPSC, MP, and ATC, and to require that the inspectors be independent of the applicants by reporting directly to the environmental manager. It is reasonable to require that the environmental manager report to the Commission.

d. Be responsible for correcting any stray voltage problems that are created by the construction or operation of the Arrowhead-Weston project.

13. The public convenience and necessity require completion of the Arrowhead-Weston project.

14. The reasonable needs of the public for an adequate supply of electric energy require the construction of a high-voltage transmission facility, the installation of a new generating facility, or some other alternative to support the electric system in WPSC's Upper West area. WPSC or ATC may submit an application for a project to satisfy this need.

15. The final Environmental Impact Statement (EIS) identifies and evaluates the significant environmental effects of the Arrowhead-Weston project, of the 115 kV transmission line that was proposed to serve WPSC's Upper West area, and of alternatives to these projects.

The EIS also identifies and evaluates proposed methods of mitigating these environmental effects.

Conclusions of Law

1. The preparation of the draft and final EIS in this docket complies with Wis. Stat. § 1.11 and Wis. Admin. Code ch. PSC 4, and the content of the final EIS complies with all legal requirements.

2. Order Point 10.2 of Advance Plan 6 does not limit the extent to which the Commission can consider the value of expanding import transfer capacity, for the purpose of improving system reliability or firm power transactions.

3. The Commission is authorized under Wis. Stat. §§ 1.12, 196.025, 196.49, and 196.491, and Wis. Admin. Code chs. PSC 111 and 112 to issue the following order and certificate, authorizing WPSC, MP, and ATC to construct the Arrowhead-Weston project.

Opinion

I. NEED FOR A NEW EXTRA-HIGH VOLTAGE TRANSMISSION LINE

A. Reliability Problems Of Wisconsin's Electric System

In this decision the Commission culminates a long process of study, analysis and discussion. Prompted by concerns that arose in 1997, when Wisconsin was unusually dependent on electric power imports because the eastern Wisconsin utilities faced unprecedented generation outages and severe supply shortages, the Commission and the state's utilities engaged in an effort to identify and address weaknesses in Wisconsin's electricity supply infrastructure.

As part of this process, in 1998 the Commission prepared its *Report to the Wisconsin Legislature on the Regional Electric Transmission System* (Report to the Legislature).[6] In this document the Commission identified significant constraints on the ability of the transmission system to support electricity imports into Wisconsin, and found that the system was in need of reinforcement if it were to continue to provide reliable electric service. In order to strengthen the system, the Commission acknowledged the need to increase the ability to import electric power into eastern Wisconsin to approximately 3,000 MW. The Commission found this level of import capability to be a reasonable target, given both the need to provide adequate electricity supply to Wisconsin customers and the uncertainty surrounding the development of new generation in the state.

Electric reliability consists of two distinct components: adequacy and security. In general terms, adequacy is ensured by arranging sufficient electricity generation resources to meet demand with a high degree of probability. When electricity supply is met in part by importing power, as is true in Wisconsin, sufficient transmission import capability is also necessary to ensure system adequacy. The second component, security, consists of planning, constructing and operating the power system so that it will withstand unpredictable but inevitable weather events and equipment failures without threatening loss of service or damage to critical equipment. In its 1998 Report to the Wisconsin Legislature, the Commission identified issues surrounding both transmission system adequacy and security.

The security issues with the transmission system identified in the Report to the Legislature remain unresolved today. The record clearly shows that a variety of problems in the

[6] Exh. 176.

existing electric transmission system exist. The bulk of the problems on the existing system can be traced back to the sparseness of transmission interconnections along the interface between eastern Wisconsin and the region to the west. When any portion of the existing 345 kV Eau Claire-Arpin line – the only extra-high voltage line across this interface – is forced out of service, the ability of the system to support power imports and to remain stable is significantly reduced.

1. Power Supply Adequacy

In this docket, the principal evidence related to the adequacy of the eastern Wisconsin power system resides in the loss-of-load expectation (LOLE) analyses that appear in the record. These analyses provide a basis from which to estimate the amount of generation and transmission infrastructure required to provide a specified level of reliability, where that level of reliability is expressed in terms of a particular probability of firm load curtailment in response to supply shortfalls. The accepted industry-wide standard for reliability is that the LOLE not exceed 0.1 day/year. If a system meets this level of reliability, system operators should need to curtail firm load in response to supply shortfalls no more often than one day every 10 years.

In order to meet an LOLE standard of 0.1 day/year, eastern Wisconsin utilities must have access to sufficient generation during power supply emergencies to meet the reasonable needs of the public. In an interconnected system, this means that eastern Wisconsin utilities must be able to rely on the transmission system to provide access to electric power generated outside of WUMS. Given data on electricity demand and the characteristics of power plants in eastern Wisconsin, a LOLE analysis can determine the amount of power imports that the eastern

Wisconsin transmission system must be able to support in order to satisfy the 0.1 day/year reliability standard.

The LOLE analyses conducted for this case show that the eastern Wisconsin power system has fallen well short of this system adequacy benchmark in recent years, and that this condition may well continue into the future, depending on increases in generation capacity within eastern Wisconsin. Moreover, the record suggests that even these estimates may be optimistic. While LOLE analysis relies on a well-defined mathematical algorithm, the real-world power system is complex and unpredictable. In the real-world power system, for example, generation outages can reduce the capability of the transmission system to support electric power imports. In addition, as historical data introduced in this docket shows, import capability on the existing system is highly variable. This data, which shows the amount of transmission import capability available on a weekly basis in recent years, also makes it clear that at times the system has not been capable of supporting any new imports above existing firm commitments. This provides important evidence that it would be difficult to rely on the existing system for purposes of accessing power during emergencies. These considerations suggest that Wisconsin's power system is marginally adequate. Moreover, the variability and uncertainty surrounding the ability of the system to support imports demonstrates that a conservative approach is appropriate when translating LOLE results into import capability targets.

The adequacy problem of Wisconsin's power system is no mere mathematical abstraction. The real-world symptoms of this problem were made apparent through abundant evidence introduced in this docket. The record shows that the Western Interface is one of the most significant transmission constraints in the combined areas of MAPP and MAIN. Data from

the MAIN reliability council show that a fully subscribed transmission network is a regularly recurring fact of life for Wisconsin utilities. The testimony of a number of utility witnesses, who spoke of the difficulty that they had in securing transmission service, underscores the pervasiveness of constraints on the system. Because of these constraints on the existing system, utilities cannot count on obtaining the power they need to maintain reliable service during periods of power supply emergencies.

Even if transfer capability into eastern Wisconsin were consistently above the level that LOLE analysis indicates is required to provide adequate electric service, this would still not resolve all adequacy concerns. This is because constraints on the Western Interface can prevent the free movement of power between individual sub-areas within Wisconsin. Because the LOLE analysis assumes a transmission system with perfect availability, this effect has real reliability implications for Wisconsin customers.

The record demonstrates that inadequacy of Wisconsin's power system affects not only Wisconsin, but a large surrounding region. Because power flows are governed by the physical characteristics of the interconnected transmission system, any particular power transfer will flow over a number of parallel transmission lines. The record indicates that more than 2,000 different transactions (distinct pairings of electricity buyers and sellers) may significantly impact the existing MAPP-WUMS interface by means of parallel path flow. As a consequence, all of these transactions, which may include transactions necessary to support reliable electric service, are vulnerable to administrative restrictions because of the limitations on this interface.

Improving the transmission system to permit a simultaneous import capability of 3,000 MW into eastern Wisconsin is a reasonable target considering the needs of the public for

an adequate supply of electric power. This will allow utilities much-needed flexibility in providing an adequate electricity supply by satisfying the 0.1 day/year LOLE criterion for the foreseeable future, even in the face of continuing uncertainties about when new generation will actually become operational. Although many developers have expressed interest in building new generation in Wisconsin, uncertainty exists regarding whether and when new capacity will become available. In addition, unforeseen circumstances may make existing generation capacity within WUMS unavailable in the future. For example, common mode failures, including possible future stringent environmental regulations, may reduce the future availability of existing generation. In addition, many existing plants have aged beyond their design lives. Given this continuing generation uncertainty, the Commission must act to ensure a robust and flexible power system capable of providing reliable electric service for Wisconsin customers.

Other factors point to the need to significantly increase import capability. These include the need to accommodate parallel-path flows through WUMS (which may be required for reliable service in other regions) and the possibility of common-mode generation failures. Moreover, as noted above, LOLE analysis does not account for all deficiencies in the electric system. Collectively, these considerations provide support for a WUMS import capability target of 3,000 MW.

Additional considerations add weight to the conclusion that an increase in transfer capability is necessary. For example, the Commission's market power study concluded that, in the absence of the significant increases in import capability that a new line would provide, the WUMS wholesale energy market would be characterized by significant horizontal market power problems.

2. Power System Security

Alongside the issues of power supply adequacy raised in this docket, power system security plays a significant role. As noted above, power system security consists of planning, constructing and operating the power system so that it will withstand unpredictable but unavoidable disruption without threatening loss of service or damage to critical equipment. While a power system suffering from adequacy problems exposes customers to the risk of curtailment (which would likely take the form of controlled rolling blackouts), a system with security problems faces the risk of outages that are uncontrolled in terms of their duration and geographical extent. Some outages resulting from security deficiencies could be isolated and not significantly affect other areas. However, some could be truly catastrophic, involving damage to generation or transmission infrastructure and the separation of the regional interconnected power system. Restarting power plants and reconnecting transmission connections and customer loads is an extremely complex undertaking that could take days to complete.

The security concerns associated with the operation of the existing Western Interface include reliance on operating guides, voltage stability and dynamic stability problems, the potential for cascading thermal overloads, and the Arpin phase angle problem.

Operating guides are special procedures carried out to improve security in the event of a line outage, impending line overload, or other system problem. While operating guides may be necessary to allow continued operation of the system, they often bring with them new security risks. A typical example involves the outage of a single transmission line, which exposes parallel transmission lines to increased power flows. In some cases these increased flows may exceed the ratings of the lines that remain in service, requiring manually opening the line at one end, thereby preventing through-flows that would cause it to overload. While this procedure

protects the line and allows it to remain in service, it also deprives customers served by that line of a dual source of supply, leaving them instead with a power line connected to a source of power at only one end. This exposes these customers to the risk of outages in the event that the single remaining connection to the system is lost.

A failure to ensure adequate voltage stability and dynamic stability exposes the system to risks of widespread outages. Under certain conditions, usually associated with high power transfer, portions of the power system can suddenly experience "voltage collapse" in which voltage plummets without warning, leading to failure. Dynamic instability involves fluctuations in the speed of rotating generators that propagate through the transmission system. These fluctuations can grow in intensity, leading to equipment damage and outages of transmission lines or generators.

A weak transmission system may be subject to cascading thermal overloads, in which outage of one line exposes additional lines to heavy flows that, in turn, cause them to be forced out of service. This can lead to a domino effect in which all connections between two regions may be lost, which typically leaves one region with a sudden generation surplus and the other with a sudden generation deficit, both undesirable situations. As the events of June 25, 1998, illustrate, large geographic areas may be affected by such a disturbance.

The Arpin phase angle problem is a consequence of the fact that the existing Eau Claire-Arpin line is the only significant connection across the Western Interface. If this line is forced out of service when significant power transfers are occurring, it cannot be immediately returned to service because of the shock that this would impose on nearby power plants. Rather, generation must be laboriously adjusted on both sides of the interface until the potential for line

reclose shock is reduced to an acceptable level. This may take hours to accomplish, leaving the system exposed to additional line outages in the interim.

The record in this case clearly shows that each of these security problems, many of which were described in the Commission's 1998 Report to the Legislature, continue to afflict Wisconsin's electric transmission system. Voltage stability limits are frequently present on the system. The need to use operating guides associated with outage of parts of the existing Eau Claire-Arpin line leaves customers in a precarious state at the end of radial transmission connections. Moreover, operating guides are required any time that certain parts of the existing Eau Claire-Arpin line are de-energized for maintenance. This is a violation of the NERC planning standards, which require that transmission systems be capable of accommodating planned bulk electric equipment outages without experiencing overloads. The Arpin phase angle problem also causes violation of additional NERC standards, by preventing restoration to a secure system state for significantly longer than the prescribed 30-minute interval. Clearly, the existing system falls short of allowing the secure operation that customers expect and industry standards dictate. Once again, each of these problems is primarily associated with the existing weakness of the interface between eastern Wisconsin and the region to the west.

As described earlier, these security problems are a concern because they threaten electric service outages. Such service outages are completely independent of, and incremental to, outages that may be necessitated by power shortages, which are accounted for in LOLE analyses. The greatest concern posed by these security problems, however, is the fact that they could lead to catastrophic breakdowns in the regional power system, which could involve significant equipment damage and widespread, lengthy and uncontrolled outages. While the disturbance of

June 25, 1998, was mostly resolved within a few hours, it nonetheless shows how weaknesses in the existing system can lead to serious disturbances, and it provides a glimpse at what a truly catastrophic outage might look like.

Use of the transmission system at present is such that power transfers across the system is often fully subscribed and thus is frequently operated near security limits. This is clear from the data in the record on transmission import capability and testimony concerning transmission loading relief (TLR) actions taken by system operators. In these circumstances, the existing power system is under considerable stress, and stable operation of the system becomes much more complex. This stress has brought the system close to collapse more than once in recent years, as described in the record. Expert testimony in this docket made a compelling case that continued operation near system security limits exposes not only Wisconsin customers but the entire region to the risk of catastrophic system failure. The body of evidence in the record supports this conclusion.

While improved operational practices can reduce the risk of catastrophic failure, they cannot eliminate it. For example, voltage stability limitations, which are frequently present on the existing system, are indicative of problems that can lead to sudden and widespread system collapse with little or no warning. Given this reality, preserving electric reliability calls for system improvements that will not only address specific security problems such as the Arpin-area operating guide, but that will also provide a greater margin of safety for everyday system operation, thereby reducing the risk of catastrophic outages. It is clear that power system planners, operators and regulators have a responsibility to take these concerns seriously and to act accordingly.

The record shows that a second extra-high voltage transmission interconnection between MAPP and WUMS would enhance reliability in eastern Wisconsin. In particular, the record shows that the Arrowhead-Weston project enables an increase of eastern Wisconsin's import capability to 3,000 MW, thereby significantly increasing access to generation resources both within and outside of WUMS. In addition, the proposed project would effectively address a number of significant security risks faced by the existing electric system. Thus the proposed project is a reasonable solution to the problems afflicting Wisconsin's power system.

B. Alternative Means Of Improving The Electric System

1. Alternatives Other than Extra-High Voltage Transmission Lines

When a need for improving the state's electric system is shown, state law prefers specific means of making such improvements. Wis. Stat. § 196.025(1) declares, "To the extent cost-effective, technically feasible and environmentally sound, the commission shall implement the priorities under s. 1.12(4) in making all energy-related decisions and orders, including advance plan, rate setting and rule-making orders." Wis. Stat. § 1.12(4) provides a list of preferred solutions, in rank order:

> (4) PRIORITIES. In meeting energy demands, the policy of the state is that, to the extent cost-effective and technically feasible, options be considered based on the following priorities, in the order listed:
>
> (a) Energy conservation and efficiency.
> (b) Noncombustible renewable energy resources.
> (c) Combustible renewable energy resources.
> (d) Nonrenewable combustible energy resources, in the order listed:
>
> 1. Natural gas.
> 2. Oil or coal with a sulphur content of less than 1 percent.
> 3. All other carbon-based fuels.

The applicants analyzed energy efficiency, the highest statutory priority, in their application and subsequently provided a supplementary analysis of energy efficiency's cost-effectiveness. WED also provided an independent analysis that included energy efficiency as a partial means of addressing the need for electric system improvements. These analyses are not sufficiently comprehensive to establish the amount of cost-effective energy efficiency, beyond what was already included in the applicants' forecast that could be used to offset the need for the Arrowhead-Weston project. Although it is likely that additional cost-effective conservation measures are available, energy efficiency alone is not a reasonable alternative to a transmission project of this size. The applicants' analysis estimates that 750 MW, or 187.5 MW per year, of sustainable reductions in electric demand would be needed by 2003 to avoid the need for the Arrowhead-Weston project. This is considerably higher than the approximately 15 MW of annual reduction in demand that the applicants have generally achieved in the past. Even if this much energy conservation could be achieved, energy efficiency will not remove existing problems with electric system security on the transmission grid. For these reasons, energy efficiency alone is not a technically feasible or cost-effective means of improving the electric system.

The Arrowhead-Weston project is also more cost-effective than installing more generation in Wisconsin. Conventional generation, renewable resources, and distributed generation would all be more expensive than constructing a new extra-high voltage line, and would not address all identified transmission system security needs.

The least costly form of conventional generation would be gas-fired combustion turbines; the least costly types of renewable resources are either wind or biomass. If a major transmission

reinforcement to external regions were not built, an additional 834 MW of combustion turbine generation would be needed for emergency dispatch to protect eastern Wisconsin's electric system. The 834 MW is based on the additional generation capacity – above an 18 percent reserve margin – that would be necessary to meet the LOLE criterion of 0.1 day/year. The record shows that the Arrowhead-Weston project would be 10 to 20 percent less expensive than constructing combustion turbine generation in Wisconsin. If renewable resources were substituted for combustion turbines, building the new extra-high voltage line would be from 30 to 55 percent less expensive. The use of microturbine or fuel cell distributed generation would also not be cost-effective alternatives at present, because these newer technologies cost even more than conventional generation. These conclusions remain valid even after increasing the estimated cost of the Arrowhead-Weston project to account for capacity charges and other contingencies, such as the likelihood that easement acquisition will be more expensive than the applicants have projected. Moreover, generation would not be as capable of resolving existing transmission system security problems, and significant uncertainties surround both the cost and availability of future generation. For these reasons, generation alone would not be a cost-effective alternative to this transmission line.

An alternative that substitutes new lower-voltage transmission lines and upgrades of existing lower-voltage transmission lines for a new extra-high voltage transmission connection between MAPP and WUMS could improve the adequacy of electric service in Wisconsin. However, this approach could not increase eastern Wisconsin's import capability to the target level of 3,000 MW, nor could it effectively address all security concerns in the existing system. Another alternative involves combining lower-voltage transmission improvements with

conventional generation, distributed generation, energy efficiency, and pricing strategies such as market-based curtailable load programs and real-time pricing. This integrated alternative cannot be accurately modeled, however, so its costs and benefits are not well defined.

A prudent long-term path to electric reliability requires that improvements to the transmission system proceed in parallel with generation additions. This ensures that the citizens of Wisconsin will have the benefits of diversification of energy sources and will not have to rely solely on generation in Wisconsin for their energy needs. This also ensures that during power emergencies Wisconsin electric utilities will have access to generation resources outside of the state for emergency power. Finally, it partially mitigates the horizontal market power that currently exists in WUMS. Under the current circumstances, the public interest is best served by a robust, long-term solution to electric transmission system problems. A new extra-high voltage transmission line is a necessary part of any such solution.

2. Alternative Extra-High Voltage Transmission Lines

The Arrowhead-Weston project is not the only extra-high voltage transmission line that could potentially meet the need, however. The record discusses several extra-high voltage transmission alternatives to the Arrowhead-Weston project. Many of these other transmission lines have technical performance attributes comparable to the Arrowhead-Weston project. However, no project application has been filed for any of these alternatives. To reject the Arrowhead-Weston project in favor of an alternative extra-high voltage transmission line that has not been fully developed in an application would mean that the state must incur further delay, while potential routes for this replacement project are investigated and a CPCN application is

prepared. Given the immediate need facing Wisconsin, further delay would not be in the public interest.

C. Restrictions on Transfer Capability

The Commission's 1992 Advance Plan 6 order[7] establishes a limitation on transfer capacity across the transmission interface between the eastern and western portions of Wisconsin. Order Point 10.2 provides, "In construction authority cases, evaluation of options affecting the interface will not recognize benefits due to transfer capacity in excess of 1,200 MW." Advance Plan 6 Order, page 120. Some parties argued that this directive applies to the Arrowhead-Weston project, which would increase import capacity above the 1,200 MW maximum. The Findings of Fact in Advance Plan 6, however, indicate otherwise. The Commission was considering the proper transfer capacity level "to accommodate economy power transactions," not to provide firm power to Wisconsin utilities and ratepayers. Advance Plan 6 Order, page 38. This prior decision quantifies the economic benefits associated with increasing transfer capacity, when such an increase is designed to expand the utilities' ability to import power for economy short-term, non-firm transactions. However, the Commission also stated, "This record does not establish the costs or benefits of long-term firm transactions across the interface." Advance Plan 6 Order, page 39. Therefore, this decision does not limit the extent to which the Commission can consider the value of expanding import transfer capacity for the purpose of improving system reliability or providing firm power transactions. The Arrowhead-Weston project's principal purpose is to improve the reliability of the transmission

[7] Docket 05-EP-6 (September 18, 1992).

system, both in Wisconsin and on a regional level. As a result, Order Point 10.2 is not relevant to this docket.

D. Meeting The Conditions For Issuance Of A Certificate Of Authority

State law requires that a CPCN project application must also comply with the conditions for issuance of a Certificate of Authority under Wis. Stat. § 196.49(3)(b), if the application is filed by a public utility. Wis. Stat. § 196.491(3)(d)5. Although MP does not meet the statutory definition of a public utility because it is a foreign corporation, both WPSC and ATC are public utilities in Wisconsin. State law, therefore, applies the Certificate of Authority criteria to the Arrowhead-Weston project. Wis. Stat. § 196.493(3)(b) provides that the Commission may disapprove the Arrowhead-Weston project if it finds that the project will do any of the following:

> 1. Substantially impair the efficiency of the service of the public utility.
> 2. Provide facilities unreasonably in excess of the probable future requirements.
> 3. When placed in operation, add to the cost of service without proportionately increasing the value or available quantity of service unless the public utility waives consideration by the commission, in the fixation of rates, of such consequent increase of cost of service. *See*, Wis. Stat. § 196.49(3)(b).

The Arrowhead-Weston project will serve electric power users in this state and in the region. The line, as approved by the Commission, will enhance the security and adequacy of electric service for all eastern Wisconsin utilities. When placed in operation, the Arrowhead-Weston project will substantially improve the ability of Wisconsin utilities to import power reliably into eastern Wisconsin. This improved ability in part will assure that the electric transmission system will be able to deliver electric power which has been committed to meet the needs of electric users in eastern Wisconsin across a much greater range of potential disruptions

to the electric system than is currently possible. Accordingly, this project will enhance and not impair the efficiency of service of ATC and WPSC and all of the other utilities in Wisconsin.

The project, as approved by the Commission, will not provide facilities unreasonably in excess of the probable future requirements of ATC and WPSC. As has been discussed above, the project enables an increase of simultaneous import capability to 3,000 MW into eastern Wisconsin. The Commission has found that the 3,000 MW target is a reasonable planning target for transmission capability into eastern Wisconsin and that this project, when constructed and placed into operation, will enhance the reliability of electric service for all customers in Wisconsin.

Finally, when placed in operation, the Arrowhead-Weston project will not add to the cost of service without proportionately increasing the value or available quantity of service. As discussed above, this project will enhance the reliability of electric service for all customers in Wisconsin and the region. This project enhances both the value of the committed generating capacity as well as the quantity of service, which can be delivered to customers in eastern Wisconsin.

E. Impact on Wholesale Competition and Customer Benefits

Under Wis. Stat. § 196.941(3)(d)7., one of the findings the Commission must make in order to issue a CPCN is that "[t]he proposed facility will not have a material adverse impact on competition in the relevant wholesale electric service market." By definition, an extra-high voltage line that expands transfer capability and facilitates commerce will promote, not adversely affect, competition in electric markets in eastern Wisconsin. In addition, the Arrowhead-Weston project will help address horizontal market power issues in WUMS. By increasing transfer

capacity, the Arrowhead-Weston project will allow more buyers and sellers to participate in electricity markets and help prevent generators from selling at excessive prices. These market forces can discipline or eliminate higher cost competitors. An independent study performed for the Commission and introduced into the record demonstrated that expanding transfer capability by means of a new extra-high voltage line would help foster a more competitive market structure in Wisconsin.[8] The Arrowhead-Weston project is such a transmission line.

Wis. Stat. § 196.491(3)(d)3t. imposes an additional requirement upon the issuance of a CPCN for this project. Under that statute, the Commission may not approve the CPCN application for an extra-high voltage line unless it finds that the line "provides usage, service or increased regional reliability benefits to the wholesale and retail customers or members in this state and the benefits of the high-voltage transmission line are reasonable in relation to the cost of the high-voltage line."

As noted above, the proposed Arrowhead-Weston project will provide significant benefits to both wholesale and retail customers in Wisconsin by substantially increasing the transfer capability into eastern Wisconsin. By increasing transfer capability, the Arrowhead-Weston project will allow more competition in wholesale electricity markets and help prevent generators from selling at excessive prices. The project will address existing transmission system operational problems such as the Arpin phase angle limitation and the current need to rely upon transmission system operating guides, and will improve both dynamic and voltage stability on the system. This, in turn, will permit the transmission system in

[8] "Horizontal Market Power in Wisconsin Electricity Market," Tabors Caramis and Associates (2000). Introduced as Exh. 244.

Wisconsin to operate more securely at higher power transfer levels, thereby enhancing the reliability of the system. Utilities in eastern Wisconsin, as wholesale customers using the Arrowhead-Weston project, will benefit from enhanced reliability of the electric system in eastern Wisconsin. The fact that all forms of generation would be significantly more expensive alternatives than the construction of the Arrowhead-Weston project demonstrates that the project's benefits are reasonable in relation to its cost.

F. EMF, Earth Currents, Stray Voltage, and Property Value Impacts

Opponents of the Arrowhead-Weston project argued that construction of such a transmission line could harm people or farm animals, because of the presence of EMF and because of earth currents. Others contended that the Arrowhead-Weston project would increase stray voltage on neighboring farms.

A significant body of research has studied whether EMF from electrical lines adversely affects human health or the health of agricultural animals; scientific evidence does not support such a conclusion. The project opponents relied upon the testimony of Dr. Duane Dahlberg when arguing that EMF and ground currents are a health risk. Dr. Dahlberg failed to offer credible testimony on these subjects. The better evidence in the record demonstrates that his theories are discredited, outdated, and not supported by scientific research. The overwhelming weight of scientific evidence indicates that exposure to EMF is extremely unlikely to result in any meaningful health impact. This conclusion is supported by the weak epidemiological evidence of any link to childhood leukemia, by the lack of a plausible biological mechanism that would explain how exposure to EMF could cause disease, and by the fact that the magnetic fields produced by electric power lines do not have enough energy to break chemical bonds or cause

DNA mutation. Whole animal studies that have investigated long-term exposure to power frequency EMF have shown no connection between exposure and cancer of any kind. Regarding earth currents (electric currents that use the earth as a return path), the record contains no credible evidence to support the theory that such currents can adversely affect human health or the health of farm animals.

Stray voltage can be a serious problem on dairy farms. Any contribution to stray voltage typically do not derive from high-voltage transmission lines. Testing procedures are available to identify stray voltage and determine its cause. In the unlikely event that the Arrowhead-Weston project were to create a stray voltage problem, reliable mitigation procedures exist to eliminate stray voltage. It is reasonable to require that the applicants be responsible for correcting any stray voltage problems that are created by the construction or operation of this project.

The proposed transmission line's potential effect on property values was a significant concern expressed by affected landowners throughout this case. Based on an overview of recently published trade and research articles, the final EIS discusses the types and degree of property value effects expected to occur as a result of transmission line construction and operation. In addition, technical witnesses sponsored by SOUL and the applicants debated the extent of the potential decrease in property values due to the proposed project.

The Commission acknowledges that the construction of new power lines may cause changes in the value of affected property. However, because so many other factors can affect the value of property and because all transmission lines do not affect properties in a similar manner, it is difficult to assess the potential dollar impacts of a particular transmission line, such as the proposed Arrowhead-Weston project. To the extent these effects can be quantified, though, the

applicants would be required to compensate individual landowners for the loss of property value either through a negotiated payment for an easement or through condemnation proceedings. The Commission has no jurisdiction with respect to determining compensation amounts or methods of payment, but it is reasonable to require that the applicants work with landowners in the placement of transmission line structures on private lands (*see* the discussion of a Construction and Mitigation Plan, below), to minimize individual hardships and adverse effects on property.

II. ROUTING THE 345 kV LINE

A. Oliver to Exeland

1. General discussion

The record describes four routes that would extend approximately 95 miles from the Town of Oliver, on the St. Louis River at the Minnesota border, to just north of the Town of Exeland. The north end of the line would connect to a new twelve-mile 345 kV line in Minnesota, extending from the Arrowhead Substation to the Wisconsin border.

In the case of an application for construction of a 345 kV transmission line, Wis. Stat. § 196.491(3)(d)3r. requires maximizing corridor sharing to the extent practicable consistent with other statutory criteria:

> For a high-voltage transmission line that is proposed to increase the transmission import capability into this state, existing rights-of-way are used to the extent practicable and the routing and design of the high-voltage transmission line minimizes environmental impacts in a manner that is consistent with achieving reasonable electric rates.

State law also requires that a transmission line route comply with other conditions enumerated in Wis. Stat. § 196.491(3)(d)3. The statute provides that the Commission may only issue a CPCN if it finds that the transmission line route "is in the public interest considering alternative sources

of supply, alternative locations or routes, individual hardships, engineering, economic, safety, reliability and environmental factors." Two of the routes, Oliver 1 and Oliver 2, were proposed by the applicants and described in the initial application. The applicants developed Oliver 1 to maximize corridor sharing, using corridors with existing transmission lines, natural gas and oil pipelines, highways, and railroads. While the main focus of Oliver 1 was corridor sharing with other utility or transportation facilities, the applicants designed Oliver 2 as a route alternative that would minimize impact on local landowners and commercial development by placing portions of the new transmission line corridor through undeveloped areas. These design goals were not fully realized. For example, one section of Oliver 1 uses a new (no existing infrastructure) corridor to avoid the Lac Courte Oreilles Reservation, and a section of Oliver 2 follows an existing transmission line corridor through a group of small lakes with many residences.

The other two routes described in the record, Oliver 3 and Oliver 1 Modified,[9] were proposed by Commission staff. Parties to the case did not propose any further routes. Oliver 3 is the same as Oliver 1, except in the southernmost quarter where it would use a different segment (segment 320) to cross the Lac Courte Oreilles Reservation on an existing transmission line corridor.[10] By doing so, Oliver 3 would further increase the amount of corridor sharing along the transmission route. East of the Reservation, Oliver 3 would continue to follow the transmission line corridor by using the southernmost segment from the Oliver 2 route (segment 312).

When the Lac Courte Oreilles tribe ultimately announced its opposition to the proposed

[9] Oliver 1 Modified is also identified in the record as the "revised" Oliver 1 route.

[10] The application also contains information on many "unused" segments, segments not included in a route proposed by the applicants that could be substituted or used to develop alternative routes.

line, the Commission staff developed a modification to the Oliver 1 route. Oliver 1 Modified further increases corridor sharing (using some Oliver 2 segments and an unused segment 315), without crossing the Lac Courte Oreilles Reservation.

The table below, drawn from Exhibit 312, provides a quantitative comparison of the environmental impacts for all of the Oliver routes.

Comparison of Oliver Routes

		Oliver 1	Oliver 2	Oliver 3	Oliver 1 Modified
General					
Total length (miles)		93.5	99.2	91.5	91.9
No existing infrastructure (miles)		18.2	47.5	6.0	10.8
Existing transmission line (miles)		56.9	17.0	78.9	62.8
New ROW (acres)	Double circuit	655	1404	304	530
	Parallel construction	1264	1518	NA	NA
Natural Resources					
Lakes within 1000 feet		7	10	12	13
River/stream crossings, no existing transmission line		20	61	2	19
River/stream crossings that are inaccessible		10	40	10	8
Outstanding/Exceptional Resource Water crossings		8	11	4	7
Wetland (non-forested), total crossed (miles)		11.8	7.4	13.8	12.6
Wetland (non-forested) no existing infrastructure (miles)		0.9	3.0	1.0	0.9
Sensitive wetlands (miles)		1.7	0.7	1.7	1.7
Wetlands greater than 800 feet wide		19	26	23	19
Wetland areas that are inaccessible		2	11	4	2
Forest, total land crossed (miles)		46	64.5	40.2	45
Forest land crossed, no existing infrastructure (miles)		11.5	49.2	3.5	5.0
Upland forest cleared (acres)	Double circuit	386.5	863.5	108.5	347
	Parallel construction	629.5	915.5	NA	NA
Wetland forest cleared (acres)	Double circuit	30.5	132.5	22.5	28.5
	Parallel construction	91.5	138	NA	NA
Social and Economic					
Public land crossed (miles)		36	23	31	32
Recreation trails (no existing transmission line)		2	4	1	2
Lac Courte Oreilles Res. Land cleared (acres)		0	0	10.4	0
Homes 0-150 feet	Double circuit	8	13	16	19
	Parallel construction	10	13	NA	NA
Homes 150-300 feet	Double circuit	36	40	47	44
	Parallel construction	30	39	NA	NA
Agricultural land, total crossed (miles)		20.7	14.9	24.8	19.9
Agricultural land crossed, no existing transmission line (miles)		7.4	9.1	2.6	3.8
Historical/Archeological sites		10	4	13	13

Oliver 1 Modified complies with the statutory requirements for transmission siting. It maximizes corridor sharing, while also recognizing the fact that the applicants cannot exercise condemnation over lands owned by the Lac Courte Oreilles Tribe. Maximizing corridor sharing reduces the amount of land required to develop a transmission line corridor. In general, this will have the effect of decreasing the acres of land where new easements must be acquired and decreasing the overall environmental impact of a transmission line. Using Oliver 1 Modified accomplishes this purpose and has a number of other advantages over the alternative Oliver routes. Oliver 1 Modified has:

1. The most miles with the potential for double circuiting with existing transmission lines. Using existing transmission line corridors generally has the least environmental and aesthetic impact.

2. The fewest river and stream crossings in roadless areas. Inaccessible areas could require building temporary or permanent access roads, which have their own environmental and aesthetic impacts.

3. The fewest Outstanding/Exceptional Resource Waters crossings. This designation by the DNR indicates a lake or stream having excellent water quality, high recreational and aesthetic value, high-quality fishing, and a lack of pollution. These locations require special mitigation practices to protect the exceptional aesthetic beauty and environmentally sensitive nature of these streams.

4. The least amount of forest lands affected, both in terms of length in miles and acres cleared. Consequently, this route involves the least loss of timber production and least aesthetic impact to forest lands.

5. The least impact on agricultural lands where no transmission line currently exists. Creating new corridors on agricultural land has the greatest impact on operation of farm machinery and loss of cropland.

In other measures of environmental impact, Oliver 1 Modified is comparable to the other choices. Its only comparative disadvantage is that more homes are located within 150 feet of this route, but this could be remedied to some extent during development of the Construction and Mitigation Plan (*see* Section III.A, below), when exact centerline and structure placement are determined.

Wis. Stat. § 196.491(3)(d)6. requires that a proposed facility "not unreasonably interfere with the orderly land use and development plans for the area involved." Oliver 1 Modified has less conflict with local land use plans than either Oliver 2 or 3. As described above, Oliver 3 would be incompatible with the Lac Courte Oreilles tribal position. Oliver 2 would unreasonably interfere with long-range plans or goals for the Washburn County Forest, several state-owned wildlife areas, the Ice Age National Scenic Trail, the North Country National Scenic Trail plans, and several state trails. Oliver 1 Modified affects some of these same types of areas but, because it uses existing infrastructure corridor, creates less conflict. Even Oliver 1 Modified will require some mitigation measures in county forests, on national trails, on state and county trails, and in wildlife areas. It is reasonable to require that the applicants develop specific mitigation requirements in the required Construction and Mitigation Plan.

All Oliver routes cross the Namekagon River, which is part of the St. Croix National Scenic Riverway. Because the National Park Service (NPS) is legally required to maintain or enhance the quality of the riverway, the applicants must apply for and obtain a permit from the

NPS before constructing such a crossing. Crossing the Namekagon River at the location of the existing transmission line has less aesthetic and environmental impact than the alternative crossing proposed, at the railroad bridge. This order, however, does not specify whether the new line should be underground or overhead, the technology if underground, or the structure type if overhead. Instead, it is reasonable for the applicants to work with the NPS to determine the exact configuration of the river crossing. Since the NPS is the governmental entity that would grant the necessary permit, any mitigation strategies should also be set by the NPS.

2. Route Description

Oliver 1 Modified is about 92 miles long, running in a southeasterly direction from the Town of Oliver, Wisconsin, on the St. Louis River (the Minnesota-Wisconsin border) to just southwest of the Town of Exeland, Wisconsin. The route crosses the St. Louis River at its narrowest point parallel to other infrastructure. It follows an existing rail and transmission line corridor through Oliver, then continues to parallel the rail corridor for over six miles to the east. It leaves the rail corridor for a short distance before turning south on Lyman Lake Road. At County C it veers southeast on or adjacent to the Lakehead Pipeline ROW. An existing transmission line then joins the corridor and Oliver 1 Modified follows this transmission line/pipeline route, which also includes a rail corridor for much of the distance, all the way through Douglas County,[11] Washburn County, and into Sawyer County. Near Boylan Road in Sawyer County, the corridor continues cross-country for about 0.5 mile to reach another existing transmission line. Oliver 1 Modified follows this line south and then east, staying just north of

[11] In one section southeast of Solon Springs there will be a dogleg off the pipeline route, and both the existing and new line will be moved southwest to allow for a planned longer airstrip.

Sand Lake, then southeast past Ham Lake, Upper and Lower Holly Lakes, and Hungry Lake. The existing transmission line route veers off past Hungry Lake, but Oliver 1 Modified continues to follow the pipeline route until it approaches the edge of the Lac Courte Oreilles Reservation. Here, Oliver 1 Modified turns south just outside the reservation to a point southeast of Summit Lake, where it turns east and avoids the southern edge of the reservation. When it intersects the pipeline corridor again, the route follows the pipeline to the Sawyer/Rusk County line, just south and west of Exeland, Wisconsin.

The project application divides each route option into segments, which are separately numbered. Starting in the north, Oliver 1 Modified consists of the following route segments: 397, 394, 393, 392, 385, 379, 377, 372, 367, 360, 359, 357, 352, 349, 346, 343, 341, 340, 339, 332c, 332a, 330, 329, 326, 325, 323b, 323a, 319, 317, 316, 314, 311.

3. Special Concerns

While Oliver 1 Modified has the least impact of the routes on the record, construction of a 345 kV line on this route will still have considerable environmental impact. A list of specific mitigation efforts is usually a part of any Commission order authorizing construction of a transmission line. Because the Arrowhead-Weston project is so long, portions of which are located in areas that are currently inaccessible, at this stage in the process not all of the environmental problems and necessary mitigation techniques can be identified. The following is a list of known areas along the route where problems are likely to be found that must be addressed in the Construction and Mitigation Plan, using site-specific mitigation techniques:

1. Inaccessible wetland on segment 392, south of Superior near Bear Creek, in an area characterized by DNR as high-quality wetland with potential for special status. Consultation with DNR is required.

2. At least two large areas of inaccessible wetlands on segment 372 in Douglas County Forest, one north of County L and another north of Tom Green Rd. Consultation with DNR and Douglas County Forestry is required.

3. Three wolf packs in the project area could be affected during the construction process: the Moose Lake pack (segment 372); the Frog Creek pack (segment 357); and the Chain Lake pack (segments 359-360). Because the location of wolf packs can shift and new packs can be identified, consultation with DNR and U.S. Fish and Wildlife Service is required to determine whether construction must be suspended in some wolf pack territories at times when wolf packs are at risk.

4. The Nature Conservancy identified two significant bird areas along segments 372 and 367 of the corridor. These areas support mating pairs of rare game and non-game birds and are considered important to their survival. Consultation with DNR and the Nature Conservancy is required on appropriate mitigation techniques to reduce the disruption of mating and nesting activities during construction and the likelihood of bird collisions.

5. Segment 372 shares corridor with an existing 161 kV transmission line. MP has proposed to change the location of this line to a new corridor between County A and Baldwin Avenue, west of Solon Springs. This section of the Arrowhead-Weston project needs to be carefully designed so that the new double-circuit line does not come any closer to residences than the existing line to residences that are within 300 feet of MP's current transmission line.

6. The North Country National Scenic Trail will be crossed by segment 367. Consultation with NPS is required.

7. The State Historical Society of Wisconsin (SHSW) has identified three archeological sites as needing field surveys by a qualified archeologist—two lithic artifact sites on segment 360 and a logging campsite on segment 357. Another site near segment 357 is not on the agency's list, but both SHSW and Washburn County agree that this site also should be protected. It is reasonable to require that archeological field surveys be done to determine the boundaries of these four sites. The Construction and Mitigation Plan shall describe any impacts to these sites, including impacts of construction equipment, and the results of consultations with Washburn County and SHSW about necessary mitigation.

8. In segment 359, the line will cross the Totogatic River and surrounding muskeg wetlands. The Totogatic River is designated a Wild and Scenic River by Washburn County, is listed on the National Rivers Inventory, and is a resource conservation area with potential for old growth forest. Consultation with Washburn County Forestry and DNR is required.

9. An extensive inaccessible wetland area is located north of STH 77 in Washburn County Forest, on segment 357. Consultation with DNR and Washburn County Forestry is required.

10. Access may need to be developed on segment 357 to a branch of Chippanazie Creek within the Lost Lake area, which is designated a Class I trout stream, and across its extensive associated wetlands. This area is cooperatively protected by Washburn County and the DNR. Consultation with Washburn County Forestry and DNR is required.

11. Crossing the Namekagon River and nearby wetlands on segment 346 must be negotiated with the appropriate state and federal agencies.

12. On segment 332, the corridor will be very close to Sand Lake, which is designated an Outstanding/Exceptional Resource Water. Consultation with DNR is required.

13. On segment 326 new crossings will be required over Alder Creek and Hauer Creek, because no existing infrastructure is present at either site. Both streams are designated Outstanding/Exceptional Resource Waters, are inaccessible, and have surrounding inaccessible wetlands. Consultation with DNR is required.

14. Part of segment 326 will be built on the southeast shore of Summit Lake, west of Summit Lake Road. No existing infrastructure is located in this area, except that part of the segment is parallel to Summit Lake Road, a narrow dirt road with tree canopy. The line must be built west of the road and next to the lake because the western boundary of the Lac Courte Oreilles Reservation is adjacent to the east of the road. The lakeshore and watershed will need to be stabilized to prevent runoff into the lake during and after construction. Since a corner structure will also be required near the lake, it must be carefully located to have the least impact possible on the now-unobstructed views from the lake. Consultation with DNR and Lac Courte Oreilles Tribe is required, and with U.S. Army Corps of Engineers as needed.

15. On segment 329, Hauer Springs wetlands, part of the headwaters for Hauer Creek, will be affected in a very wild and undeveloped area. An inaccessible branch of Hauer Creek will be crossed. Consultation with DNR is required.

16. Exact placement of the northern end of segment 329 should be reviewed. The pipeline and transmission line corridors separate just past Hungry Lake. The approved corridor

stays with the pipeline route but the application proposed a southerly displacement from the pipeline corridor for some distance, just past Hungry Lake. This displacement would move the line closer to several homes on Hungry Lake. The final alignment for this section of the line must be clearly described in the Construction and Mitigation Plan.

17. Segment 323 crosses the Tuscobia Falls State Trail. No overhead infrastructure now exists at this crossing, so structure placements must be kept as far from the trail as possible. Consultation with DNR is required.

18. Segment 311 affects the Wiergor Springs Wildlife Area. Little Wiergor Creek is a Class II trout stream. Consultation with DNR is required.

19. Several county trails will be affected: Little Douglas County Trail (segment 393); Wild Rivers Trail (segment 377); and trails in the Douglas County Wildlife Area (segment 367). Consultation with Douglas County is required.

20. Many other sensitive and inaccessible wetland areas along this route will need careful attention in the Construction and Mitigation Plan. Consultation with appropriate agencies is required.

21. The Lac Courte Oreilles tribe is considering a survey of ceded lands for archeological sites that might be affected by the transmission line. If the tribe finds sites and reports them to SHSW, changes in centerline and structure placement shall be made where needed to avoid damage to the sites.

B. Exeland to Weston

1. General discussion

Between Exeland in Sawyer County and the Weston Power Plant in Marathon County, the proposed routes fall into two sectors: the Owen sector or the Tripoli sector. Within either sector several routes have been proposed. Using routes in the Owen sector, the transmission line would extend southeast from Exeland to the vicinity of Owen in Clark County, and then proceed east to Weston. Using routes in the Tripoli sector, the transmission line would first extend east from Exeland to near the Price-Lincoln County line, where it would then turn south and continue to Weston. Routing the transmission line from Exeland to Weston first required that either the Owen or the Tripoli sector be chosen; then, a route within the preferred sector be selected.

The final EIS shows that the Owen sector routes share more of their corridor with existing facilities and have considerably fewer environmental impacts than the Tripoli sector routes. All four Owen sector routes share existing facility corridors to a greater extent than any of the routes in the Tripoli sector. These facility corridors now contain electric transmission lines, petroleum pipelines, railroads, and roads. The Owen 3 and Owen 4 routes allow the most corridor sharing; approximately 63 percent of these routes share corridors with existing infrastructure. In the Tripoli sector, the Tripoli 3 or Tripoli 4 routes would provide the greatest amount of corridor sharing, but only about 31 percent of their ROW would be shared. Wis. Stat. § 196.491(3)(d)3r., which prefers transmission line routes that maximize corridor sharing, therefore favors the Owen sector. This statute declares that the Commission must select a route for this project using existing ROW "to the extent practicable," and that "minimizes environmental impacts in a manner that is consistent with achieving reasonable electric rates." A further comparison of the environmental impact associated with routes in the Owen and Tripoli

sectors shows that choosing the Owen sector will also minimize environmental impact. Compared to Tripoli sector routes, the Owen sector routes would fragment one-third to one-eighth the number of large forest blocks, cross half as many streams with potential construction access difficulties, cross two-thirds as many wetlands with potential access difficulties, and require one-half to one-third as much forest clearing.

Neither the Owen sector routes nor the Tripoli sector routes would unreasonably interfere with orderly land use and development plans, as specified in Wis. Stat. § 196.491(3)(d)6. Most lands crossed are not zoned, or zoned for agricultural or conservancy uses. The Tripoli sector routes would cross, on average, more land zoned residential or conservancy than the Owen sector routes. A new electric transmission line could inhibit residential development or constrain the layout of residential lots. Agricultural land that is crossed by a new transmission line could still be farmed, but the line may adversely affect some aspects of farm operation. Conservancy areas could also continue as low-intensity use lands, often maintained in a natural state, although clearing the ROW would alter wooded land in both appearance and function.

The Owen sector is superior to the Tripoli sector for routing the Arrowhead-Weston project because of its ability to maximize corridor sharing and reduce environmental impact in general. The applicants, though, also proposed a means of serving WPSC's Upper West (Rhinelander) area that depends upon selecting the Tripoli sector for the Arrowhead-Weston 345 kV line, because it would involve the construction of a new 115 kV transmission line from a proposed substation near Tripoli to the Highway 8 Substation in Rhinelander. If this were the only means of serving the Upper West area, routing the Arrowhead-Weston project through Tripoli and building the Tripoli Substation might become necessary despite the disadvantages of

the Tripoli sector routes. However, as described in Section IV below, a number of other methods do exist to improve the electric system in the Upper West area and the optimal route for the Arrowhead-Weston project need not be held captive by the choice of methods for providing service to the Upper West area. Thus, a route within the Owen sector is the proper location for the Arrowhead-Weston project.

As described above, the Owen 3 and Owen 4 routes maximize corridor sharing and minimize the amount of new ROW required. Both routes would minimize the number of stream crossings, wetland crossings, the acreage of forest clearings, and the crossing of large forest blocks. Owen 4 is superior to Owen 3 in that it has fewer stream crossings, particularly crossings of very high quality streams that the DNR has designated Outstanding and Exceptional Resource Waters. Owen 4 also crosses less land zoned residential. The table below, drawn from the final EIS,[12] compares the environmental impacts for all of the Owen routes:

Comparison of Owen Routes

	Owen 1	Owen 2	Owen 3	Owen 4
General				
Total length (miles)	124.7	116.4	117.5	118.4
No existing infrastructure (miles)	73.6	58.5	42.8	44.1
Existing transmission line (miles)	31.6	15.4	37.5	38.1
New ROW (acres) Double circuit	1,705	1,802	1,544	1,552
Parallel construction	2,001	NA	1,737	1,745
Natural Resources				
River/stream crossings, no existing transmission line	38	34	28	22
River/stream crossings that are inaccessible*	35	28	24	21
Outstanding/Exceptional Resource Water crossings	8	2	8	2
Wetland (non-forested), total crossed (miles)	16.2	13.9	13.4	13.1
Wetland (non-forested) no existing infrastructure (miles.)	7.0	6.8	5.0	4.6
Wetlands greater than 1,000 feet wide	25	28	29	28
Wetlands that are inaccessible	129	110	103	106

[12] EIS Table 12-3, p. 659

		Owen 1	Owen 2	Owen 3	Owen 4
Forest, total land crossed (miles)		44.3	35.9	33.5	33.7
Forest, land crossed, no existing infrastructure (miles)		23.4	16.0	11.2	12.2
Upland forest cleared (acres)	Double circuit	484	443	373	369
	Parallel construction	580	NA	417	414
Wetland forest cleared (acres)	Double circuit	116	98	76	85
	Parallel construction	134	NA	87	96
Social and Economic					
Public land crossed (miles)		3.5	2.6	2.4	2.6
Historical / Archeological sites		1	2	2	2
Homes 0-150 feet	Double circuit	12	15	14	15
	Parallel construction	10	NA	14	15
Homes 150-300 feet	Double circuit	19	30	26	27
	Parallel construction	21	NA	26	27
Agricultural land, total crossed (miles)		57.4	58.1	62.9	64.0
Agricultural land crossed, no existing transmission-line (miles)		41.6	50.0	40.4	41.3
Recreation trails (no existing transmission line)		1	1	1	1

Overall, Owen 4 would result in the least environmental impact of the Owen routes. Commission staff developed this route alternative, which is substantially similar to Owen 3, to reduce the number of very high quality waterways and inaccessible waterways that would need to be crossed. Where Owen 3 would cross eight Outstanding and Exceptional Resource Waters and 10 trout streams, and would require crossing rivers and streams in 24 locations that are currently inaccessible, Owen 4 crosses two Outstanding and Exceptional Resource Waters and three trout streams, and involves 21 inaccessible crossings.

2. Route Description

Owen 4 begins near Exeland and follows a petroleum pipeline southeast to a point northwest of Owen. The route turns south and continues cross-country to an existing electric transmission line ROW that passes south of Owen. Between Owen and Abbotsford, Owen 4 follows an electric transmission line corridor from which a portion of the existing transmission line has recently been removed. Between Abbotsford and Edgar, the route follows a recently

rebuilt electric transmission line. The route then continues east, cross-country, to the Weston Substation.

Owen 4 consists of the following segments, which are described in the project application: 308', 303, 301b, 301a', 242', 240, 239, 237, 235, 233, 231, 230, 229, 226, 223, 213', 211, 207, 205, 204, 202c, 202a, 23b, 23a, 21, 18, 16, 11, 8b, 8a, 1b, 1a.

3. Special Concerns

1. An existing transmission line on H-frame structures, built to 161 kV standards but operated at 115 kV, currently crosses directly through the Three Lakes Wetland Mitigation Site, east of Abbotsford. Bird collisions are a problem in this area. Segment 205 of the Owen 4 route passes just south of this mitigation site; the applicants agreed to move the 115 kV line out of the mitigation area and onto segment 205, using double-circuit structures with the 345 kV transmission line. This is a reasonable means of reducing the risk of bird collisions with the wires.

2. The wood turtle (*Clemmys insculpta*), a threatened species, has been observed in several locations on segments 1 and 242. The Blanding's turtle (*Emydoidea blandingii*), a state threatened species, has also been observed on segment 239, west of Sheldon. Since construction activities could present a threat to turtle nests, it is reasonable to require that construction be avoided in areas inhabited by these turtles during the egg-laying and hatching time of June to late September.

III. CONDITIONS FOR APPROVAL OF THE 345 kV LINE

A. Construction And Mitigation Plan

WPSC and MP proposed general construction guidelines in their project application and in testimony that they would use to reduce environmental damage. The final EIS discusses these and other construction procedures commonly used when building transmission lines. This is the most complex transmission project ever proposed in Wisconsin, though, and its approved route passes through areas where the environmental impact is not yet clearly understood. It is, therefore, reasonable to require that the applicants develop a comprehensive Construction and Mitigation Plan, in cooperation with the Commission and appropriate resource agencies, that will provide very specific information about environmentally sensitive resources on the route and how they will be protected. Preparing and complying with this plan will ensure maximum consideration of the environmental and socioeconomic concerns expressed on the record by other governmental resource agencies and by area residents. For ease in development and to enable the applicants to proceed with the timely planning and construction of the Arrowhead-Weston project, the plan shall have two parts: Part A, concerning construction and mitigation practices of general applicability, which the applicants can prepare immediately; and Part B, concerning site-specific construction and mitigation measures, which the applicants must prepare after the project route is specifically identified and further examination of the affected area for sensitive resources has occurred.

1. Part A of the Plan

The first part of the Construction and Mitigation Plan shall be a compilation of all general construction and mitigation practices that will be applied across the entire project area. These

practices include, but are not limited to, erosion control measures and construction methods to be used in wetlands, across bodies of water, through agricultural fields, and in upland forested areas. Part A of the plan shall also include revegetation and restoration procedures. In addition, detailed duties and responsibilities of environmental inspectors and of an environmental manager must be described in this part of the plan, as well as the inspection and reporting procedures these persons will use. The applicants shall develop Part A in cooperation with all appropriate federal and state government resource agencies. The applicants may not commence construction activity, as defined in Wis. Stat. § 196.491(1)(b), until the Commission approves Part A of the Construction and Mitigation Plan.

2. Part B of the Plan

The second part of the plan shall address specific construction and mitigation measures that are needed at locations where sensitive resources are present. Examples of such areas include known archeological sites, unique or unusual wetland or forest types, the Namekagon River and the Ice Age National Scenic Trail. Locations where sensitive resources are known to be present are described in Section II of this order. Other locations are currently unknown, but are likely to be identified during the final engineering survey, when the centerline and ROW boundaries are staked, and while construction is actually occurring. To ensure that these sites are properly protected, this portion of the plan must be cooperatively developed among the applicants, the site-specific landowner or manager, and all appropriate agencies. This part of the Construction and Mitigation Plan may be developed in sections that correspond to geographic boundaries, potential construction spreads, or other logical units that form the basis for inspection and reporting. If the applicants find it necessary to adjust the route so that its location

differs in any way from the route described in this order, these changes shall be described in Part B of the Construction and Mitigation Plan. The applicants may not commence construction in a specific unit until the Commission approves Part B of the plan for that unit.

In addition to the cooperative development of a Construction and Mitigation Plan, the applicants agreed that one or more environmental inspectors should be hired to monitor construction and site restoration activities to ensure adherence to the approved plans. Several landowners and parties to the case, including the DNR, also testified to the need for independent environmental monitors that would have the authority to stop work if violations of the Construction and Mitigation Plan or regulatory permit conditions occur.

In order to ensure that the applicants comply with the Construction and Mitigation Plan, these environmental inspectors must be independent and have an active role in the final design, siting, and construction of the Arrowhead-Weston project. Examples of their involvement include helping to determine the final centerline and placement of structures, monitoring all construction activities to ensure compliance with the mitigation procedures identified in this order and in the Construction and Mitigation Plan, identifying other environmentally sensitive sites while construction is in progress that need protection, and recommending appropriate revegetation and restoration procedures. An independent, third party environmental manager will be needed to oversee all aspects of environmental compliance.

The applicants shall work with Commission staff to prepare a request for proposal (RFP) for the positions of environmental inspector and environmental manager. The RFP shall contain the scope of duties, responsibilities and authority of each position. The environmental inspectors shall function primarily as field staff. Multiple environmental inspectors will be needed, because

of the likelihood that crews will be working at several construction spreads at any one time. The environmental manager shall make site visits as necessary. The environmental manager's primary responsibilities shall be to oversee all environmental inspection activities and coordinate environmental reporting to the Commission and other applicable resource agencies.

The applicants and the Commission shall review the proposals received in response to the RFP, with the final selection and hiring done by the applicants. The applicants shall fund the salaries and expenses of the environmental inspectors and the environmental manager. The environmental inspectors shall report, weekly or more frequently, directly to the environmental manager. In turn, the environmental manager shall report to the Commission at least monthly throughout the period of active construction of the line.

In their testimony, the applicants requested some flexibility in determining the final centerline for the proposed project. The applicants proposed that this routing flexibility would allow them the opportunity to work with landowners and to reduce impacts to humans, animals, businesses, and the environment. The applicants also cited a potential need to adjust the alignment of the line to account for sensitive resources and other circumstances discovered during the final engineering survey.

Granting the applicants some ability to make minor adjustments in the centerline, once the engineering survey and surveys for cultural resources or threatened and endangered species are completed, may be necessary. It is also reasonable to require the applicants to work with landowners in determining the final structure locations. However, any changes in alignment from the proposed centerline shall not affect resources or cause new impacts not discussed in the final EIS, nor shall they affect new landowners who have not been given proper notice and the

opportunity to comment on the proposed project. Part A of the Construction and Mitigation Plan shall provide a detailed description of the guidelines and process for altering the proposed centerline, and Part B shall identify any routing changes that the applicants are recommending.

In order that the Commission can determine the one-time environmental impact fee and the annual impact fee that the applicants must pay to the Wisconsin Department of Administration, as described under Wis. Stat. §§ 16.969 and 196.491(3)(gm) and (3g), in Part B of the Construction and Mitigation Plan the applicants shall include the number of miles of the approved 345 kV transmission line that would be located in each of the eleven affected counties and the number of miles of line in each township and municipal district in those counties. For an exact identification of the final route, the applicants shall record the location of each transmission structure using global positioning system (GPS) technology. The applicants shall transfer this data to a geographic information systems database, using software compatible with state government standards, and include this data with Part B of the Construction and Mitigation Plan.

B. Double-Circuit Construction With Existing Transmission Lines

The applicants have declared that they prefer to build the new transmission line as double circuit with existing lines, rather than parallel to existing lines but on separate structures. The approved route follows the existing ROW of a number of transmission lines owned by Northern States Power Company-Wisconsin (NSPW) and by Dairyland Power Cooperative (DPC). NSPW expressed concerns that constructing the Arrowhead-Weston project not compromise its existing facilities or land rights, and recommended that the NSPW facilities should be rebuilt on the same structures used for the extra-high voltage transmission line.

In the interest of maximizing corridor sharing, the Commission has selected a route that utilizes these existing ROWs to the extent practicable. The applicants, NSPW, and DPC should be able to resolve any issues concerning the sharing of these corridors amongst themselves, without advance Commission direction. However, the Commission has the authority under Wis. Stat. § 196.04 (2) to prescribe acceptable terms of use for the shared corridors if these parties are unable to reach an agreement on their own that satisfies the concerns of each entity and protects both the state's electric system and the environment.

C. Use Of Fiber-Optic Communication Line As A Shield Wire

The applicants originally proposed that one of the shield wires used for the Arrowhead-Weston project would be comprised of a fiber-optic communication line, consisting of 48 fibers. Only 10 to 12 of these fibers would be used to control and monitor power flows on the transmission line; the applicants intended to lease the remaining fiber-optic capacity to any interested third party for general communications. Members of the public raised concerns about combining such an unregulated, revenue-producing activity with the construction of a transmission line, in part because of the possibility that utility condemnation authority would be used to promote a nonutility business venture. Subsequently, the applicants removed the cost of this component from project cost estimates and declared that they would not pursue its use unless a third party came forward to share in the costs.

To avoid the use of utility authority in a manner that may subsidize a nonutility activity, it is reasonable to reject the use of a fiber-optic communication line as shield wire. Instead, the applicants shall substitute a power line carrier system, which is adequate for system operation.

IV. IMPROVING THE ELECTRIC SYSTEM THAT SERVES WPSC'S UPPER WEST (RHINELANDER) AREA

A. Reliability Problems Of The Upper West Electric System

That part of WPSC's electric service territory extending north from the Merrill and Antigo areas is known as the "Upper West" area. The weaknesses in the transmission system serving this area have long been recognized. Growing electricity demand in the area is pushing the system even closer to the point where a voltage collapse event – which would cause an extensive blackout – could result from an outage of one of the two key 115 kV transmission lines that serve this area. In prior Advance Plans the Commission has identified the need to reinforce this area to keep pace with growing demand, and in the intervening years the need for reinforcing the Upper West area power system has increased, not decreased. The updated need analysis included in the current application was uncontested.

To serve this area, WPSC proposed building a new 115 kV transmission line, 42 miles long. The line would extend from the Highway 8 Substation in Rhinelander to a new substation in Tripoli, which would receive power from the Arrowhead-Weston project. However, because this order directs the use of Owen routes for the Arrowhead-Weston project, not Tripoli routes, the Tripoli Substation will not be built. As a result, WPSC's proposal is not a feasible means of serving the Upper West area.

B. Alternative Means Of Improving The Upper West Area

The record describes a number of alternatives to the proposed Tripoli-Rhinelander 115 kV line that could improve the electric system in the Upper West area. These include new Rhinelander-area generation as well as alternative transmission line projects. Although these

ideas are not fully developed, they appear to be feasible methods of meeting the local need, at reasonable economic and environmental costs. Since the Commission would need to complete its review of any alternative Upper West area reinforcement that requires a CPCN within the statutory 180-day timeline, the electric needs of the Upper West area can be promptly addressed. It is therefore reasonable to deny WPSC's request for a CPCN to build the proposed 115 kV transmission line from the Tripoli Substation to the Highway 8 Substation. Instead, WPSC or ATC may submit a project application for an alternate means of serving this area. With such an application, WPSC or ATC is not required to resubmit information in the current record about the need to improve electric service in the Upper West area. The filing will be sufficient if it confirms that this need still exists.

V. SUFFICIENCY OF THE EIS

Wis. Stat. § 1.11(2) requires the Commission to prepare a detailed EIS for any "major action" it is considering that would significantly affect the quality of the human environment. The Commission has adopted rules that categorize the types of actions it undertakes, for purposes of complying with this statute. Wis. Admin. Code § PSC 4.10(1) and Table 1 provide that a proposal to construct a 345 kV electric transmission line more than 10 miles long, that would require construction activity outside existing ROW, is a major action significantly affecting the quality of the human environment. As a result, Commission staff commenced work on a draft EIS. On May 5, 2000, the Commission released a two-volume draft EIS on the proposed Arrowhead-Weston project, including the 345 kV line and the Rhinelander 115 kV line. The Commission distributed its draft EIS broadly to interested persons, encouraging people to provide written or oral comments during a 45-day comment period. The Commission staff

also hosted public meetings in six locations within the project area during the weeks of June 5 and 12, 2000, to solicit comments on the project and the draft EIS. On October 3, 2000, the Commission released its final EIS.[13] The final EIS substantially expanded the draft EIS, adding about 200 pages; in total, it is approximately 850 pages long. The final EIS evaluates the need for the project, alternatives to the 345 kV and 115 kV transmission lines, and the costs and potential environmental effects of the proposed routes for these lines. The final EIS analyzed four alternative routes from Oliver to Exeland, four alternative routes from Exeland to Weston via Tripoli and four alternative routes from Exeland to Weston via Owen. The various alternative routes covered almost 1400 miles.

In the course of this docket, some parties have argued that the Commission's final EIS is inadequate because it does not provide sufficient site-specific information about the natural resources present along the entire length of the proposed transmission line routes. These parties also alleged that the document does not adequately describe the environmental mitigation measures that could be implemented to reduce damage to the natural environment, or the expected efficacy of mitigation strategies that are covered in the final EIS.

Some sections of the proposed routes pass through areas that are remote and inaccessible by foot or road, under normal circumstances. Other sections are located on private property, which neither the applicants nor the Commission has authority to enter without the landowner's permission. Because access to areas such as these may be impossible, it was not feasible to include specific information about every foot of each of the alternative routes analyzed in the final EIS. Instead, the Commission's final EIS reasonably examined and disclosed all significant

[13] The final EIS was introduced into the record as Exh. 172.

impacts to the quality of the human environment that are associated with this project. More detailed descriptions of the existing environment in the project area would not substantially change the evaluation in the final EIS.

The discussion of mitigation procedures in the final EIS covers general practices commonly used in the construction of transmission lines and natural gas pipelines through environmentally sensitive areas. The common imposition of these practices by regulatory agencies demonstrates their efficacy. In addition, the applicants will be required to prepare a Construction and Mitigation Plan that consists not just of these general practices, but also requires the development of detailed site-specific construction procedures and methods for protecting sensitive resources that are identified in the EIS and during engineering surveys and during construction of the project. This plan will require Commission approval prior to the commencement of construction, and will be developed by the applicants in consultation with other appropriate agencies.

The Commission finds that the preparation of the draft and final EIS complied with the requirements of Wis. Stat. § 1.11 and Wis. Admin. Code ch. PSC 4. The final EIS also complies with all legal requirements regarding the description and analysis of the project itself, alternatives to the project, the project's potential impacts, and the mitigation procedures that could be employed to reduce these impacts.

Certificate

WPSC, MP, and ATC may construct the Arrowhead-Weston project as a new 210.2 mile, 345 kV transmission line and required substation upgrades, using the facilities described in the application and as modified by this order, at an estimated cost of $165,721,000. The new

transmission line shall connect MP's Arrowhead Substation near Duluth, Minnesota, with WPSC's Weston Substation near Wausau, Wisconsin, following the Oliver 1 Modified Route and the Owen 4 Route.

Order

1. The CPCN for the Arrowhead-Weston project is valid only if the applicants commence construction, as defined in Wis. Stat. § 196.491(1)(b), no later than one year after the latest of the following:

   a. The date when this order is no longer subject to judicial review or all appeals resulting from such judicial review have been finally determined.

   b. The date when all other federal, state, and local approvals, permits and licenses that are required prior to the commencement of construction are no longer subject to judicial review or all appeals resulting from such judicial review have been finally determined.

   c. The date when the Commission has approved both Part A and Part B of the Construction and Mitigation Plan for all construction spreads.

2. The applicants shall submit quarterly progress reports to the Commission indicating the Arrowhead-Weston project's major construction and environmental milestones, the extent of physical completion to date, and expenditures to date, commencing within 90 days of the date that construction commences.

3. The applicants shall notify the Commission before proceeding with any substantial changes in the design, size, cost (exceeding 10 percent of the estimated cost shown in the Certificate above), location, or ownership of the Arrowhead-Weston project facilities.

4. Upon completion of the Arrowhead-Weston project, the applicants shall notify the Commission when the facilities are placed in service and report the actual cost segregated by plant account.

5. The applicants shall develop and submit for the Commission's approval a Construction and Mitigation Plan, as described in the Opinion above. Commencement of construction, as defined in Wis. Stat. § 196.491(1)(b), may not occur until the Commission approves Part A of this plan. In addition, commencement of construction in a specific unit of the Arrowhead-Weston project may not commence until the Commission approves Part B of the plan for that unit. In developing Part B of the Construction and Mitigation Plan, the applicants shall work with landowners on the placement of transmission line structures on private property to minimize individual hardships and adverse impacts on property. The applicants may also propose minor adjustments in the centerline for the protection of cultural or environmental resources, but any changes in alignment from the proposed centerline shall not affect resources or cause impacts not discussed in the final EIS, nor shall they affect new landowners who have not been given proper notice and hearing. Part B of the Construction and Mitigation Plan shall:

a. Identify all proposed routing changes in Part B of the plan.

b. Address the special concerns of the Oliver 1 Modified and Owen 4 routes, discussed in the Opinion above, where mitigation techniques must be used. The applicants shall describe the mitigation techniques required by the NPS to cross the Namekagon River at the existing transmission line crossing, on the Oliver 1 Modified route.

c. Identify and provide very specific information about the environmentally sensitive resources located on the route, and how these resources will be protected.

d. Identify the location of each transmission structure using global positioning system technology and transfer this data to a geographic information systems database, using software compatible with state government standards.

6. The applicants shall work with Commission staff to prepare an RFP to hire environmental inspectors and an environmental manager. The RFP shall include the scope of duties, responsibilities, and authority of each position. The applicants shall hire enough environmental inspectors so that inspectors can be present at every construction spread where work is occurring. The inspectors and manager shall be independent and have the authority to stop work at any construction spread if they identify a violation of the Construction and Mitigation Plan or of any regulatory permit conditions. The inspectors and manager shall also have an active role in the final design, siting, and construction of the Arrowhead-Weston project. The environmental manager shall oversee all aspects of environmental compliance.

7. The applicants shall promptly stop work on a construction spread if directed to do so by an environmental inspector or the environmental manager.

8. The applicants shall comply with all requirements described in the Opinion above for known areas of special concern along the Oliver 1 Modified and Owen 4 routes.

9. The 115 kV transmission line currently located in the Three Lakes Mitigation Site shall be moved to segment 205, rebuilt to its current 161 kV standard and installed on double-circuit structures with the 345 kV transmission line portion of the Arrowhead-Weston project.

10. In areas inhabited by the threatened species wood turtle and Blanding's turtle, construction activities shall cease during the egg-laying and hatching period of June to late September.

11. The applicants shall promptly correct any stray voltage problems that are created by the construction or operation of the Arrowhead-Weston project.

12. WPSC's request for a CPCN to construct a 42-mile, 115 kV transmission line from a new Tripoli Substation to the Highway 8 Substation in Rhinelander is denied. WPSC or ATC may file an application for an alternate means of serving need in the Upper West area.

13. This order takes effect on the day after issuance. The CPCN for the Arrowhead-Weston project does not take effect until the DNR has issued all necessary permits and approvals that are required prior to construction.

14. Jurisdiction is retained.

Dated at Madison, Wisconsin, _____

By the Commission:

_____

Lynda L. Dorr
Secretary to the Commission

LLD:JAL:mem:g:\order\pending\05-CE-113 Final.doc

See attached Notice of Appeal Rights

Notice of Appeal Rights

Notice is hereby given that a person aggrieved by the foregoing decision has the right to file a petition for judicial review as provided in Wis. Stat. § 227.53. The petition must be filed within 30 days after the date of mailing of this decision. That date is shown on the first page. If there is no date on the first page, the date of mailing is shown immediately above the signature line. The Public Service Commission of Wisconsin must be named as respondent in the petition for judicial review.

Notice is further given that, if the foregoing decision is an order following a proceeding which is a contested case as defined in Wis. Stat. § 227.01(3), a person aggrieved by the order has the further right to file one petition for rehearing as provided in Wis. Stat. § 227.49. The petition must be filed within 20 days of the date of mailing of this decision.

If this decision is an order after rehearing, a person aggrieved who wishes to appeal must seek judicial review rather than rehearing. A second petition for rehearing is not an option.

This general notice is for the purpose of ensuring compliance with Wis. Stat. § 227.48(2), and does not constitute a conclusion or admission that any particular party or person is necessarily aggrieved or that any particular decision or order is final or judicially reviewable.

Revised 9/28/98

APPENDIX A
(CONTESTED)

In order to comply with Wis. Stat. § 227.47, the following parties who appeared before the agency are considered parties for purposes of review under Wis. Stat. § 227.53.

Public Service Commission of Wisconsin
(Not a party but must be served)
610 N. Whitney Way
P.O. Box 7854
Madison, WI 53707-7854

ALLIANT ENERGY - WISCONSIN POWER AND LIGHT COMPANY
Mr. Ritchie J. Sturgeon, Attorney
222 West Washington Avenue
Madison, WI 53703

AMERICAN TRANSMISSION COMPANY
Ms. Lauren L. Azar, Attorney
Michael, Best & Friedrich, LLP
One South Pinckney Street
P.O. Box 1806
Madison, WI 53701-1806

MR. DENNIS AND MS. CATHY BARBER
N54 W35709 Hill Road
Oconomowoc, WI 53066

MS. PATRICIA BERG
R814 Mount View Lane
Athens, WI 54411

MR. GERALD AND MS. LINDA CEYLOR
N3689 Riley Road
Catawba, WI 54515

CITIZENS' UTILITY BOARD
Mr. George Edgar, Attorney
3rd Floor, c/o WECC
211 South Paterson Street
Madison, WI 53703

CONCERNED NORTHWOODS CITIZENS

Ms. Anna M. Threlfall
N3438 Woodlawn Road
Kennan, WI 54537

DAIRYLAND POWER COOPERATIVE
Mr. Jeffrey L. Landsman, Attorney
Wheeler, Van Sickle & Anderson, S.C.
25 West Main Street, Suite 801
Madison, WI 53703

MR. FRANK FIEREK, SR.
W245 S7365 Heather Ridge Drive
Waukesha, WI 53189

LOCAL 2150, IBEW
Mr. Forrest Ceel, President/Business Representative
N8 W22520 Johnson Drive, Unit H
Waukesha, WI 53186

MIDWEST ANATOLIANS
Mr. Gary and Ms. Barbara Jakobi
3154 County Road O
Marathon, WI 54448

MR. EDWARD KRENZELOK
1125 Tall Trees Drive
Pittsburgh, PA 15241

MADISON GAS AND ELECTRIC COMPANY
Mr. James C. Boll, Jr., Attorney
133 South Blair Street
P.O. Box 1231
Madison, WI 53701-1231

MINNESOTA POWER COMPANY
Ms. Deb Amberg, Senior Attorney
Minnesota Power Company
30 West Superior Street
Duluth, MN 55802-2093

MUNICIPAL ELECTRIC UTILITIES OF WISCONSIN (MEUW)
Mr. Michael P. May, Attorney
Boardman Law Firm
1 South Pinckney Street, 4th Floor
P.O. Box 927
Madison, WI 53701-0927

NORTH AMERICAN WATER OFFICE
Mr. George Crocker, Executive Director
P.O. Box 174
Lake Elmo, MN 55042

NORTHERN STATES POWER COMPANY-WISCONSIN
Mr. Jordan J. Hemaidan, Attorney
Michael Best & Friedrich, LLP
One South Pinckney Street, Suite 700
P.O. Box 1806
Madison, WI 53701-1806

SAVE OUR UNIQUE LANDS (S.O.U.L.)
Mr. Edward R. Garvey, Attorney
Mr. Glenn M. Stoddard, Attorney
Ms. Pamela McGillivray, Attorney
Garvey & Stoddard, S.C.
634 West Main Street, Suite 201
Madison, WI 53703

CHRIS VIEGUT
1001 West 4th Street
Marshfield, WI 54449

MR. DAVID WERNER
N7505 Preston Lane
Ladysmith, WI 54848

WISCONSIN ALLIANCE OF CITIES
Mr. Edward J. Huck
14 West Mifflin Street, Suite 206
Madison, WI 53703-2576

WISCONSIN CENTRAL LTD
Mr. Michael J. Barron, Jr., Attorney
One O'Hare Centre
6250 North River Road, Suite 9000
Rosemont, IL 60018

WISCONSIN ECONOMIC DEVELOPMENT ASSN.
Mr. James E. Hough, Executive Director
10 East Doty Street, Suite 500
Madison, WI 53703

WISCONSIN ELECTRIC POWER COMPANY
Ms. Catherine Phillips, Attorney
231 West Michigan Street, Room P346
Milwaukee, WI 53201-2046

WISCONSIN ENVIRONMENTAL DECADE
Mr. Frank Jablonski, Attorney
7 North Pinckney Street
Madison, WI 53703

WISCONSIN FEDERATION OF COOPERATIVES
Mr. Warren J. Day, Attorney
131West Wilson Street, Suite 400
Madison, WI 53703

WISCONSIN GROCERS ASSOCIATION
Mr. Brandon Scholz, President
2601 Crossroads Drive, Suite 185
Madison, WI 53718-7923

WISCONSIN INDUSTRIAL ENERGY GROUP (WIEG)
Mr. Richard L. Olson, Attorney
LaFollette, Godrey & Kahn
One East Main Street, P.O. Box 2719
Madison, WI 53701-2719

WISCONSIN MANUFACTURERS AND COMMERCE
Mr. Eric Borgerding
Director, Legislative Relations
501 East Washington Avenue
Madison, WI 53703

WISCONSIN MERCHANTS FEDERATION
Mr. Douglas Q. Johnson
Senior Vice President and General Counsel
30 West Mifflin Street, Suite 310
Madison, WI 53703

WISCONSIN PAPER COUNCIL
Mr. Earl Gustafson
250 North Green Bay Road, P.O. Box 718
Neenah, WI 54957-0718

WISCONSIN PUBLIC POWER, INC.
Mr. Michael Stuart, Attorney
1425 Corporate Center Drive
Sun Prairie, WI 53590-9109

WISCONSIN PUBLIC SERVICE CORPORATION
Mr. Trevor J. Will, Attorney
Foley & Lardner
777 East Wisconsin Avenue
Milwaukee, WI 53202-5367

WORLD ORGANIZATION FOR
LANDOWNER FREEDOM (WOLF)
Ms. Carol A. Overland, Attorney
Overland Law Office
P.O. Box 559
Red Wing, MN 55066